Nutritional Support in Critically Ill Patients

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Fruit and vegetables
Bread, other cereals, and potatoes
Meat, fish and alternatives
Milk and dairy products
Foods containing fat and foods containing sugar

Eating a balanced diet
is vital for being alive and good health.

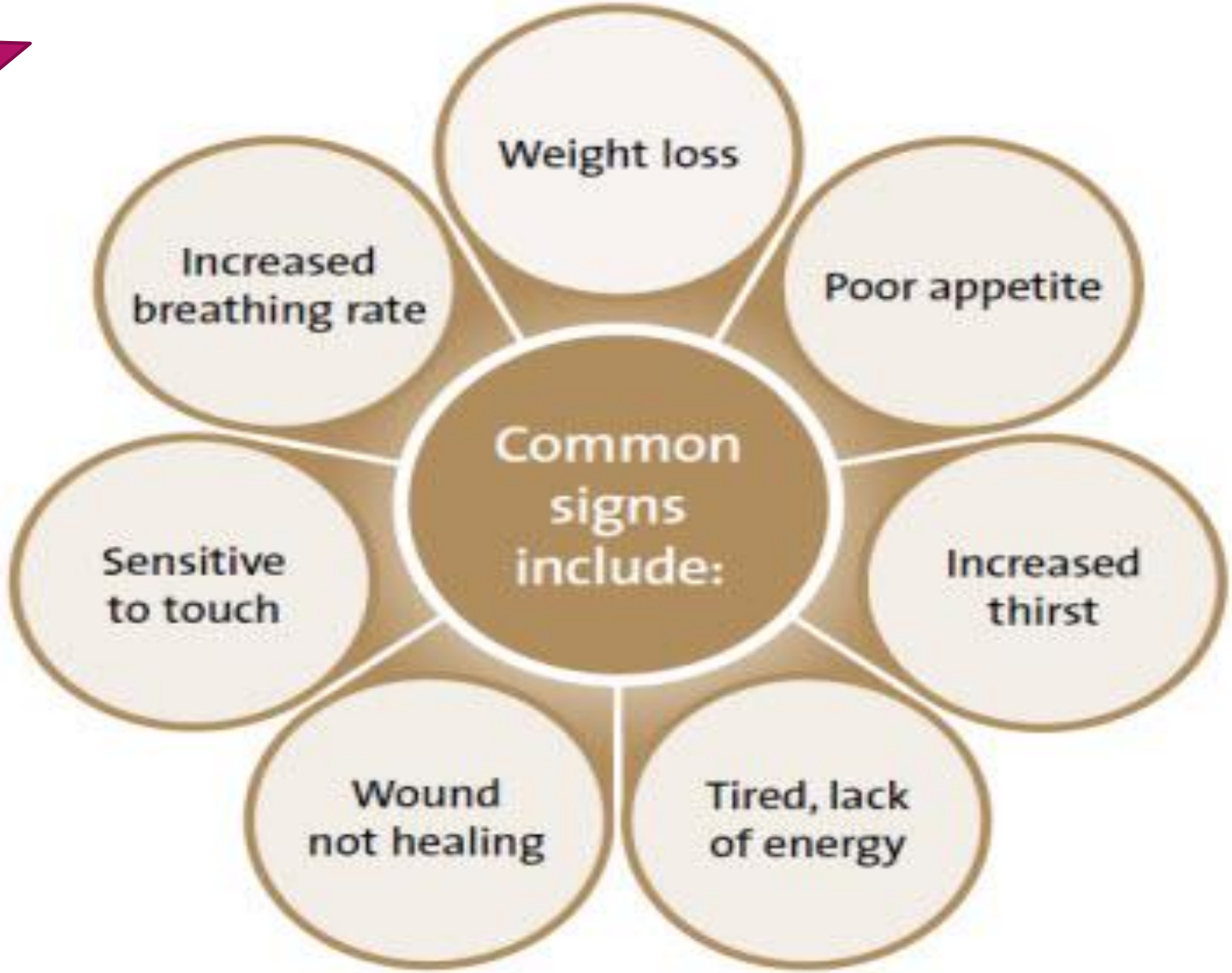
Proper diet
provides our bodies with the energy,
protein, essential fats, vitamins and minerals to live,
grow and function properly.

Australian National Health & Medical Research Council,2014

Patients at Risk of Malnutrition:

- ✓ Under/Overweight Patients
- ✓ Patients who have recent weight loss
- ✓ NPO more than 10 days
- ✓ Hypermetabolic Patients
  (Burn,Fever,Infection,Sepsis,Trauma,…)
- ✓ Great Surgeries(GI Disturbances)
- ✓ Critically Ill patients

Serious Illness Common Signs



Malnourished Hospitalized Patients:

Increased Morbidity

Compromised Surgical outcomes, Post Surgical Complications, Poor Wound Healing, Alteration in Immune Function, …

Increased LOS

Decreased Respiratory Muscles Function,Slower Ventilator Weaning, Increased Infetcion Rate, Pressure Ulcers, …

Increase Mortality Rate

Burns, AACN 2014

Factors that affect nutritional status in critically ill patients:

- *Inability to take oral diet*
- *Nausea/Vomiting/Diarrhea*
- *Glucose intolerance*
- *Renal dysfunction*
- *Liver dysfunction*
- *Pain*
- *Restricted fluid intake*
- *Delayed gastric emptying*
- *Reduced gut motility due to drugs,…*

Nutritional Needs Changes in Critically Ill Patients:

Increased Nutrition Losses

- *Blood Loss*
- *Severe Diarrhea*
- *Fistulae*
- *Draining Abscesses*
- *Wounds/Pressure Ulcers*
- *…*

Increased Nutrition Requirement:

- *Fever*
- *Surgery*
- *Trauma*
- *Burns*
- *Infections*
- *Cancer*

Simple Starvation due to inadequate intake

Hypermetabolism due to injuries that increase the metabolic rate

Critical ill patients have starvation+hypermetabolism

Catabolism

Protein-Calorie Malnutrition

Physiological impact of starvation vs. stress

Category	Starvation	Stress
Catabolism	+	+++
Glycogenolysis	+	+
Glucogenesis	+	+++
Lipolysis	+++	++
Ketosis	+++	++
Energy expenditure	Decreased	Increased
Serum albumin	No change	Decreased
Urine urea nitrogen	<5 g /day	> 5 g/day
Nitrogen balance	Negative	Strongly negative
EC water	Mild increase	Marked increase
Disease states	Anorexia nervosa, malabsorption	Severeinflammation,sepsis, burns, head injury

Critically ill Patients Loose 10% - 20 % of body Proteins within a week

Malnutrition is common
in
acute-care settings,
occurring in 30% to 50%
of
hospitalized patients

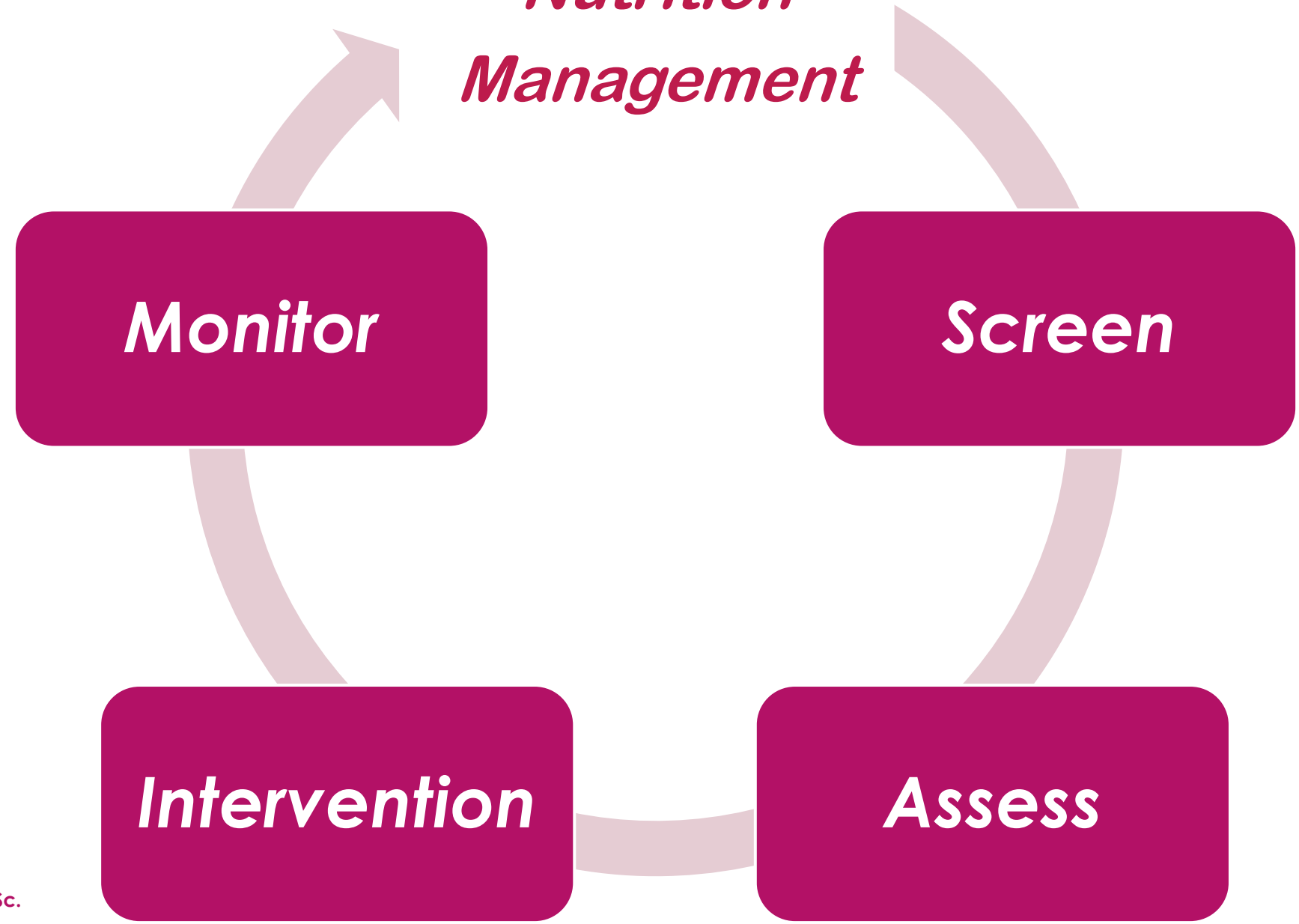
Powers&Samaan,2014

The Critical Care Unit nurses

is in the best position
to advocate for appropriate nutritional therapies
and
Facilitate the safe delivery of nutrition

Powers&Samaan,2014

Nutrition Management



MUST
Malnutrition Universal Screening Tool

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Nutritional Screening

Simple and Rapid Evaluation

Identifies

- Malnourished
- At Risk

NUTRITION ASSESSMENT

Nutritional Assessment:

- ***Health History***
- ***Physical Examination***
- ***Anthropometric Measurement***
- ***Biochemical(Laboratory) Measurement***

Health History:

- ***Maldigestion history***
- ***Abdominal pain***
- ***Diarrhea/Constipation***
- ***Anorexia***
- ***Weight Loss***
- ***GI Surgery history***
- ***Alcohol use***
- ***Drugs***
- ***…***

Physical Examination:

- ***Inspection: Abdomen appearance, Subcutaneous tissue, …***
- ***Auscultation: Bowel Sounds***
- ***Palpation: Superficial/Deep***
- ***Percussion: Mass/Fluid/Gas,…***

Anthropometric Measurement:

- ***Height & Weight(IBW?)***
- ***BMI***
- ***TSF***
- ***MAC***

Ideal body Weight(IBW)

Female:

IBW= 45.5 + 2.3 ×[(height – 150)÷2.5]

Male:

IBW=50 + 2.3 × [(height – 150) ÷ 2.5]

PBW?

Body Mass Index(BMI)

BMI= Weight(Kg) ÷ Height(m)²

وضعيت وزن	ميزان نمايه توده بدني
لاغر	<19
طبيعي	19 – 24.9
داراي اضافه وزن	25 – 29.9
چاق	≥ 30

Adult Body Fat % = (1.2 × BMI) + (0.23 × age) – (10.8 × gender) – 5.4

{ Gender for men : 0 for women : 1 }

Description	*Women*	*Men*
Essential fat	10–13%	2–5%
Athletes	14–20%	6–13%
Fitness	21–24%	14–17%
Average	25–31%	18–24%
Obese	32%+	25%

Biochemical Data

- ***Serum proteins(Total proteins, Albomin/Prealbomin, Ferritin, …)***
- ***Electrolytes(Na, K, Mg, Ca, Ph, …)***
- ***Hematologic Values(Hb, MCV,MCH, WBCs, …)***

MNA
Mini Nutritional Assessment

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Nutritional Support for Critically Ill Patients

Route?

Entral Nutriton(EN)

**** Oral(First Choice)***

**** OG/NG Tube(Second Choice)***

**** Postpyloric Feeding Tube(Third Choice)***

When?

Within 24 hours

Quantity?

Day 1: 10-15 Kcal/kg/day

Day 2-4: 15-20 Kcal/kg/day

Day ≥ 5: 20-25 Kcal/kg/day

Composition?

- ***High quality Protein***
- ***Low glycemic index***
- ***Soluble fiber***
- ***Omega 3 fatty acids***

Up to Date 2016, Marik PE 2010

The two Commandments of Nutritional Support:

* *If the bowel works, use it*

(and if it doesn't, make it work)

* *There is no disease process that benefits from starvation*

Entral Nutrition
Is the preferred method
of
Feeding The critically ill patients

Up to Date 2016

Nutrition support in critically ill patients Overview 24 12 2016.docx

ALERT

In the critically ill patients,

neither the presence

nor the absence of bowel sounds,

nor evidence of the passage of flatus or stool

is required

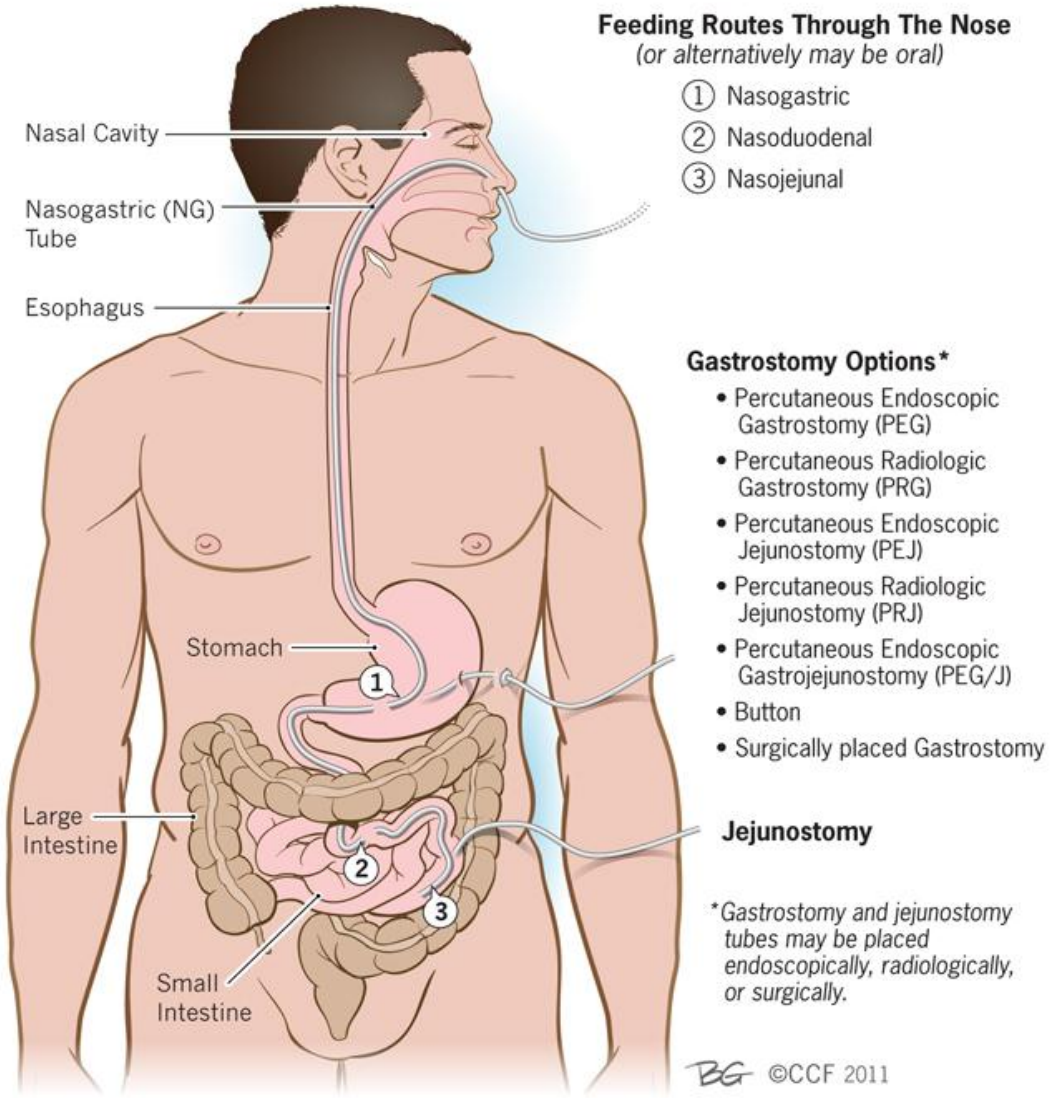
for the initiation of enteral feeding.

Marik,2010

ENTRAL NUTRITION

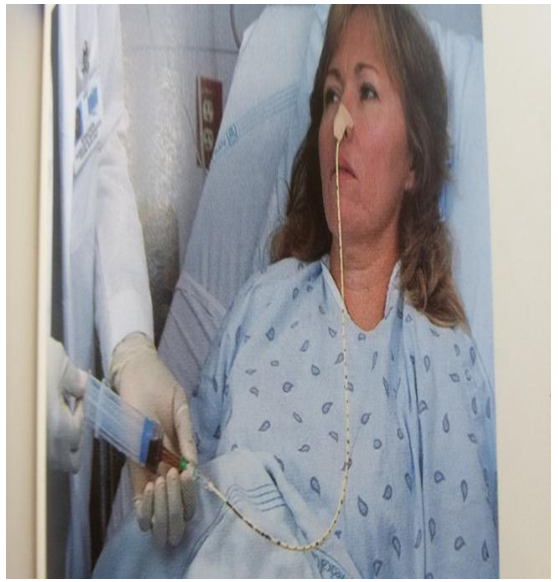
EN(Entral Nutrition)
TEN(Total Entral Nutrition)

- Oro/Nasogastric
- Gastrostomy
- Nasodeodenal
- Nasojejunal
- Jejunostomy
- Percutaneous Endoscopic Gastrostomy(PEG)
- Percutaneous Endoscopic Jejunostomy(PEJ)



Tube Placement Confirmation

- ***PH Measurement***
- ***Air Bubble Auscultation***
- ***Radiography***
- ***Tube length measurement***



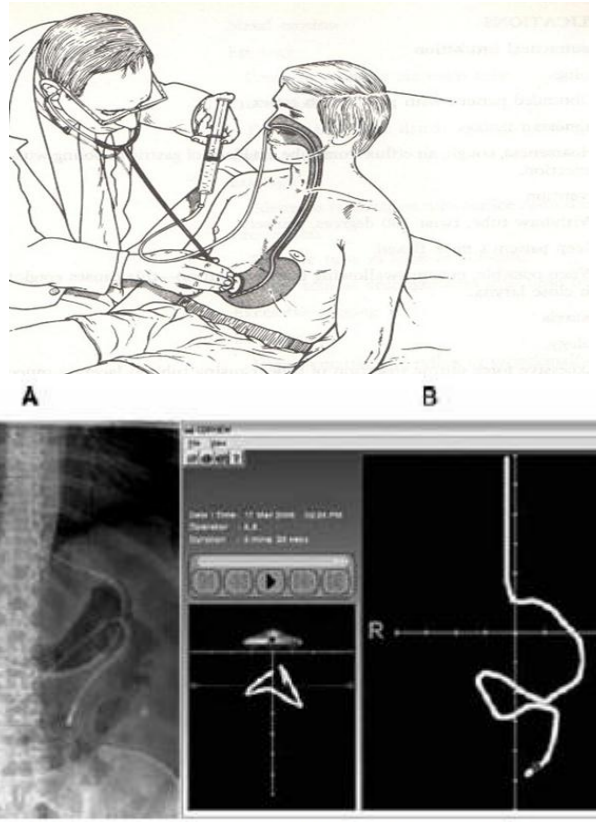


Figure 1 - A - Post-placement abdominal x-ray; B - Screenshot example of an electromagnetically guided tube.

Benefits of EN

1. *Stimulates immune barrier function*
2. *Physiologic presentation of nutrient*
3. *Maintain gut mucosa*
4. *Simplifies fluid/electrolyte management*
5. *More complete nutrition than PN*
6. *Less infectious complications(and costs of associated complications)*
7. *Stimulates return of bowel function*
8. *Less expensive*

Common Barriers to Optimizing EN Delivery:

- *Diagnostic/Therapeutic procedures*
- *Tube obstruction*
- *Feeding held due to drug-nutrient interaction(Propofol(1.1 cal/ml, ...)*
- *Hypotensive episodes(need to be in recumbent position)*
- *Perceived or real " GI intolerance or dysfunction " :*

  ** N/V/D*

  ** Abdominal distention& Complaints of fullness*

  ** Lack of BS*

  ** Aspiration risk/ no gag*

  ** GRV > 400ml*

ENTRAL NUTRITION COMPLICATIONS:

- ✓ Pulmonary Aspiration& Aspiration Pneumonia(5-36%)
- ✓ Diarrhea
- ✓ Constipation
- ✓ Tube Occlusion
- ✓ Gastric Retention
- ✓ Dumping Syndrome

Reducing Aspiration Risk

- Strict use of Semi-recumbent(>30 ◦ BRE)
- Accurate Placement
- Proper Route(Continuous,Intermettent)
- Prokinetic Medication(Metoclopramide, …)

Strict use of semi-recumbent position Is the most consistent&potent means To reduce the likelihood of aspiration.

Up to Date 2016, Burns,AACN 2014

No enough eveidences To demonstrate association Between Gastric PH, colonization And Pneumonia incidence Between Patients fed with cyclic vs. continuous feeding.

Up to date 2016

Nutrition support in critically ill patients EN 24 12 2016.docx

GRV?

GRV Measurement?

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***Endogenous Secretion & Exogenous Additions**

***The Cascade Effect**

***Checking Gastric Residual Volume** *(Burns AACN,2014:P 374)*

Dumping Syndrome Prevention

Due to fast passage of the fluids from the bowel

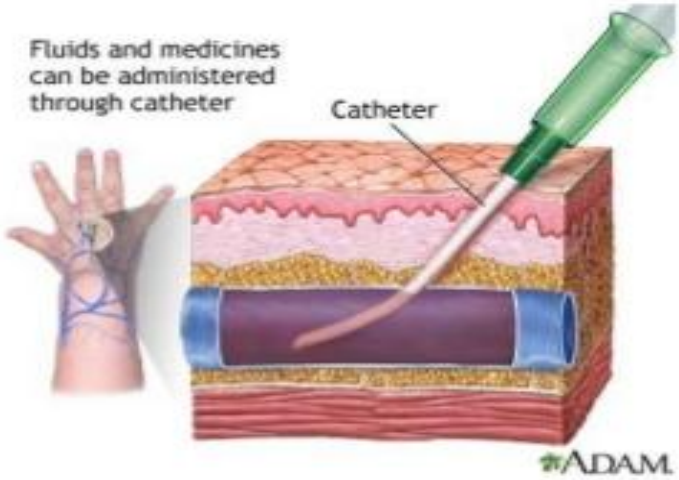
- *Abdomen examination(BS, Distention, …)*
- *Assess stool characteristics*
- *I&O measurement*
- *Food proper temperature(room temperature)*
- *Pay attention to carbohydrate(sugar) content of the diet*
- *Slower nutrition*

PARENTRAL NUTRITION

TPN

PPN

Peripheral Venous Access Vs Central Venous Access



VS

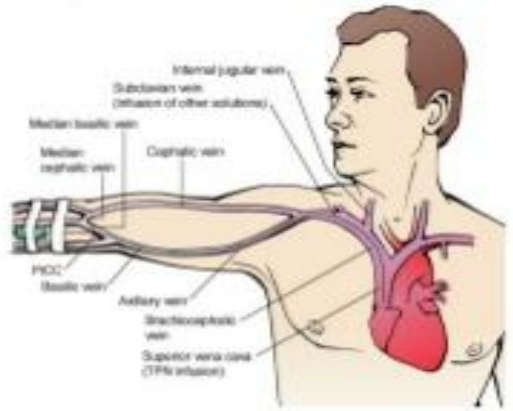


Figure 46-9 Placement of peripherally inserted central catheter (PICC).

Peripheral Venous Access

Central Venous Access

Jugular V.
Subclavian V.
Femoral V.
PICC

Even short-term PN
used to supplement EN in ICU patients,
has not enhanced benefits
and
it's associated with
increased infectious complication
and
length of stay(LOS).

Burns AACN 2014

There are no data that
Parenteral Nutrition
is of any benefit to critically ill patients.

The available evidence suggests that
Parenteral Nutrition
increases complications and mortality rates.

Marik 2010

PN is usually indicated in:

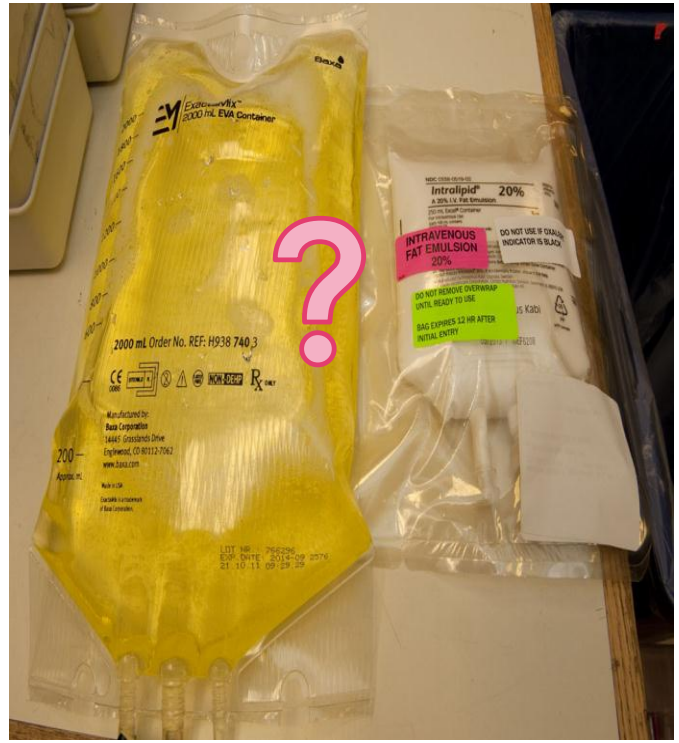
- *Inability to absorb nutrients via GI tract doe to :*
  - ** Massive small bowel resection/short-bowel syndrome(at least initially)*
  - ** Radiation enteritis*
  - ** Severe diarrhea*
  - ** Steatorrhea*
- *Complete bowel obstruction*
- *Persistent ileus*
- *Sever catabolism with or without malnutrition when GI tract is not usable within 5-7 days*
- *Inability to obtain enteral access / Inability to provide sufficient nutrients or fluids enterally*
- *Persistent GI hemorrhage / Acute abdomen*
- *Lengthy GI work-up requiring NPO status*
- *High output enterocutaneous(>500 ml) if enteral feeding ports cannot be distally placed*
- *Trauma requiring repeat surgical procedure*

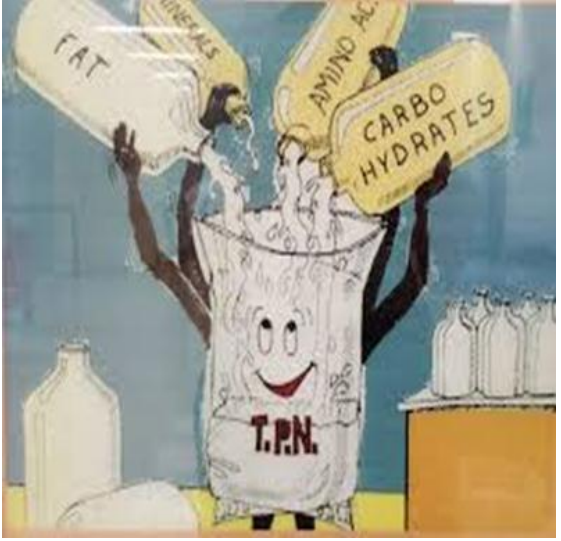
PN may be indicated in:

- Inflammatoy bowel disease not responding to medical therapy
- Intensive chemotherapy /severe mucositis
- Major surgery/stress when enteral nutrition not expected to resume within 7-10 days
- Chylous ascites or chylothorax
- Enterocutaneous fistula (<500 ml)
- Partial small bowel obstruction
- Hyperemesis gravidarum when N&V persist longer than 5-7 days and EN is not possible

Contraindication for PN

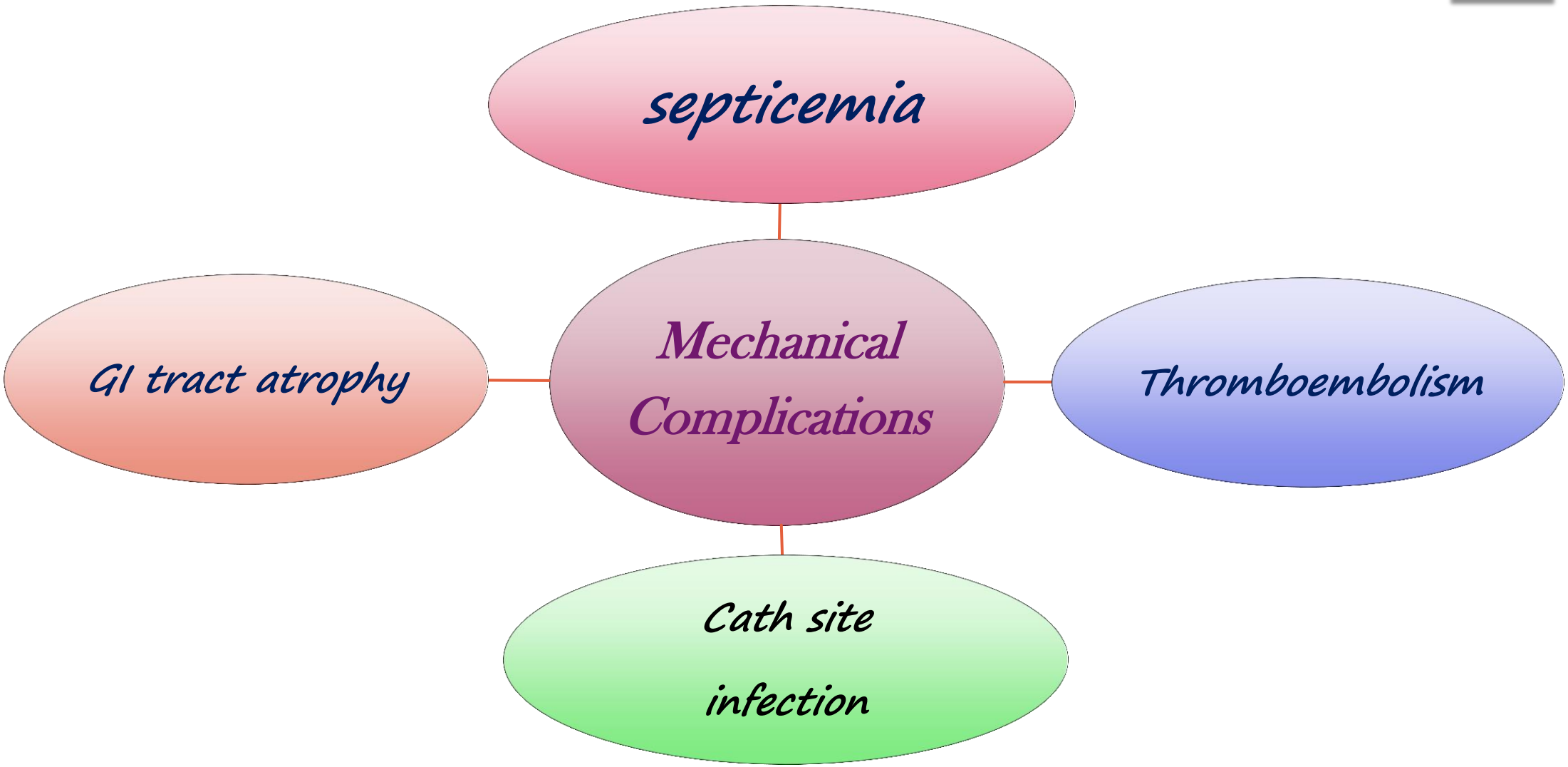
- *Functioning GI tract*
- *Treatment anticipated for < 5 days in patients without severe malnutrition*
- *Inability to obtain venous access*
- *A prognosis that does not warrant aggressive nutrition support*



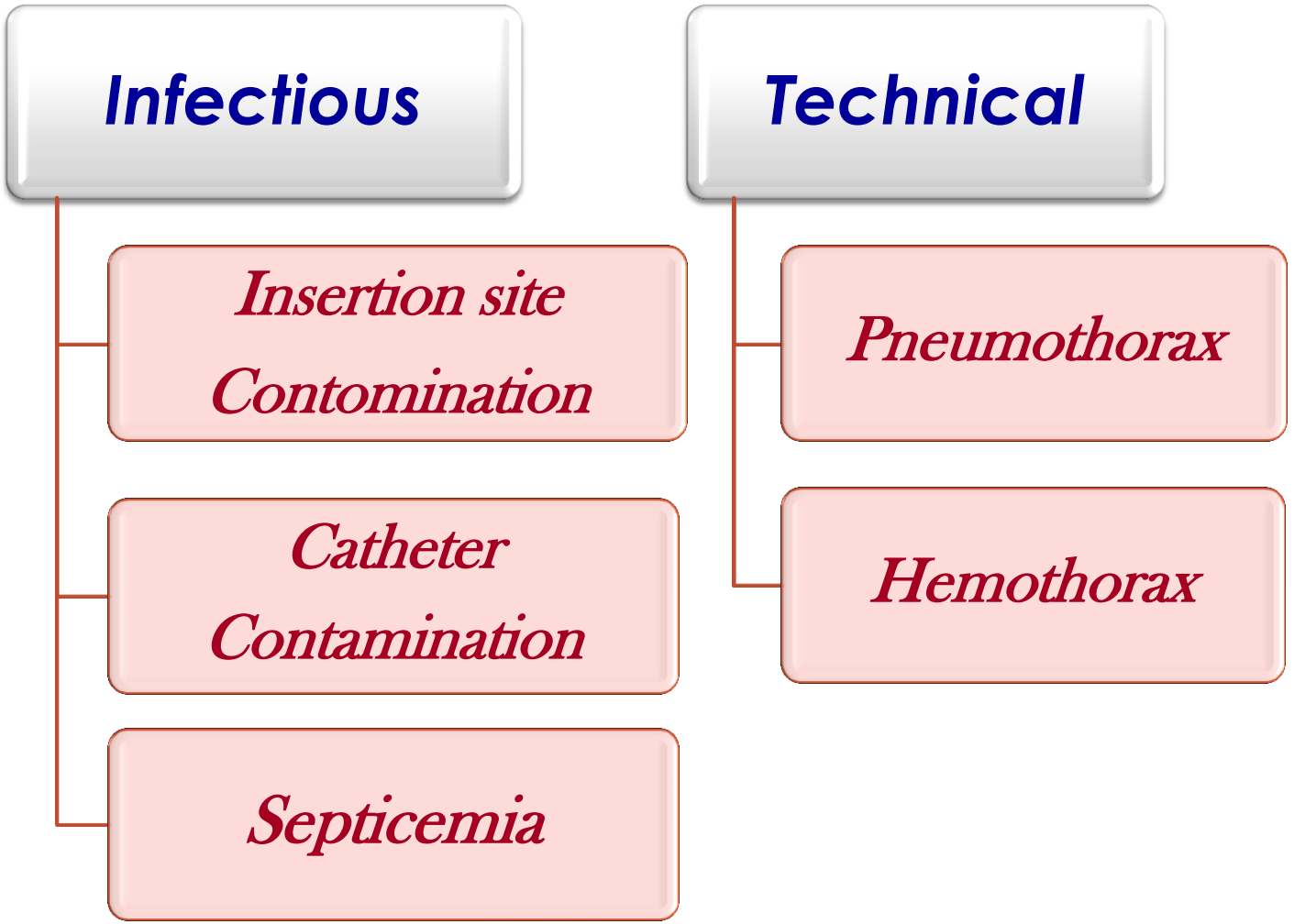


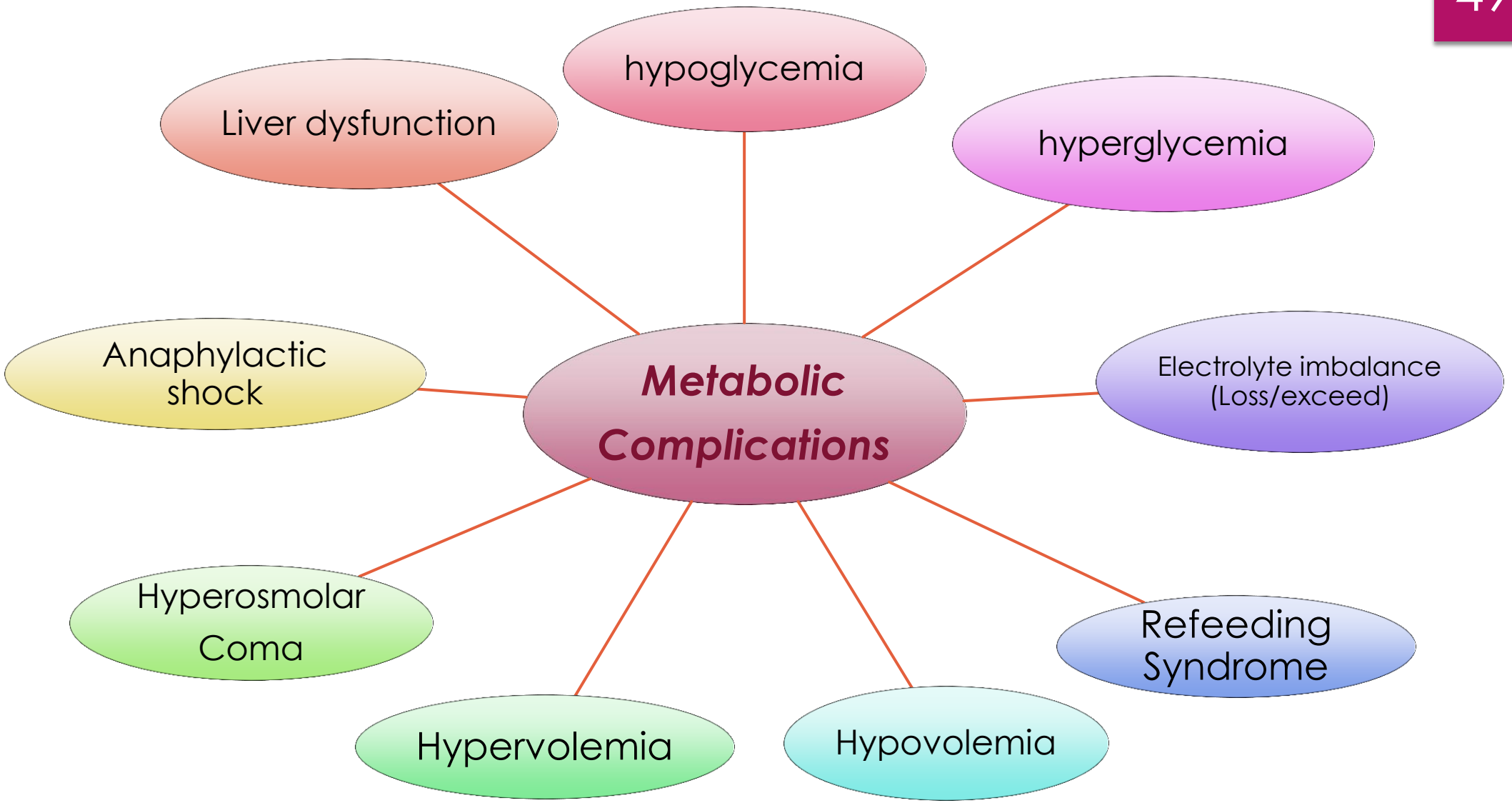
TPN Content

- Carbohydrates
- Aminoacids
- Lipid
- Vitamines
- Minerals
- Trace Elements


septicemia
GI tract atrophy
Mechanical Complications
Thromboembolism
Cath site infection

Catheter-related Complications




Metabolic Complications
hypoglycemia
Liver dysfunction
hyperglycemia
Anaphylactic shock
Electrolyte imbalance (Loss/exceed)
Hyperosmolar Coma
Refeeding Syndrome
Hypervolemia
Hypovolemia

Refeeding Syndrome

Potentially fatal condition resulting from rapid changes in fluids and electrolytes when malnourished patients are given oral, enteral, or parenteral feedings.

Patients with ongoing electrolyte losses (eg, from diarrhea, vomiting, fistulas) are at increased risk of refeeding syndrome.

Manifestations:

- ***Severe hypophosphatemia (including respiratory failure, cardiovascular collapse, rhabdomyolysis, seizures, and delirium)***
- ***Hypokalemia***
- ***Hypomagnesemia***

A meta-analysis of 15 randomized trials(1647 patients)

found that critically ill patients

who received vitamins and trace elements,

either alone or in combination,

had a lower mortality rate than patients who did not receive them.

Similar meta-analyses showed

improvement in the duration of mechanical ventilation,

but no differences in infectious complications,

and Hospital or ICU length of stay.

Up to date 2016